# 1999 Comparative Analysis of Enterprise (Micro) Data Conference Program

### *R&D, Innovation*

## Profitability and Innovation: An Empirical Investigation

**Eleonora Bartoloni**

**Maurizio Baussola**

In this paper we investigate the relationship between innovation and profitability (as measured by return on investment) using data for 8674 firms selected from two statistical surveys set up by the National Institute of Statistics (ISTAT) for the Italian manufacturing industry and covering the period 1991-95. These surveys are the Community Innovation Survey (CIS1), which describes technology adoption in Italian manufacturing industries, and the Firms'Account System Survey (SCI), which deals with firms' balance sheet data. The relationship between technology adoption and profitability is analysed in two separate cross-sections of data, that for 1992 and 1995. This depends on the nature of the technology adoption data, which does not enable us to know the number of innovations introduced by each firm in each year. The innovation variable is just qualitative, as we only know if a firm adopted or non adopted a new technology between 1990-92. Thus, we specify an empirical model which shows that technology adoption is positively and significantly affected by profitability in a logistic cross-section regression for 1992, suggesting that a 10% increase in profitability increases the adoption probability by more than 10%. We also test the reverse relationship, i.e., whether innovation in an earlier period affects profitability in subsequent times. We do find support to this hypothesis, in that innovation in 1990-92 positively and significantly affects profitability in 1995. We underline that this average aggregate result is driven by the relationship between technology adoption and profitability in small and medium sized enterprises.

**Keywords**: Innovation, Profitability, Logit models

**JEL Classification**: O30, O40

## The Importance of Innovation for Firm Performance

**Luuk Klomp**

**George van Leeuwen**

The main results of the second Community Innovation Survey (CIS-2) for the Netherlands are presented in this paper. A major strength of the data collection in CIS-2 is that it covers all three stages of the innovation process: input (e.g. intramural R&D expenditures and innovation expenditures), throughput (e.g. extramural R&D expenditures and innovation co-operation) and output (e.g. innovations and turnover of new products). This enables us to analyse both the links between the input, through put and output stages of the innovation process and the links between the innovation process and economic performance. We investigate feedback mechanisms between the stages of the innovation process and analyse the relation between innovation and firm performance using a simultaneous-equations model.

**Keywords**: R&D, innovation output, simultaneous-equations models, economic performance.

## Measuring Technological Innovation by Using Firm- and Innovation Level Data

**Ari Leppälahti, Statistics Finland & VTT Group for Technology Studies**

**Christopher Palmberg, VTT Group for Technology Studies**

This paper provides a general comparison of two new Finnish innovation datasets of manufacturing firms. The first one is the Finnish contribution to the Second Community Innovation Survey and the second is innovation data based on the object approach methodology compiled by VTT Group for Technology Studies. Although the percentage levels of innovative firms in the datasets are different, the main innovation indicators are with some modifications mainly consistent. Besides the empirical findings, the fundamentals of the survey methodologies as well as their strengths and weaknesses are discussed.

## *Firm and Labour*

### The Relative Demand for Skills - Short-run and Long-run Shifts in the Structure of Labour Demand

**Arnd Kolling, Institute for Employment Research**

The adoption of modern technologies in the production process or the international trade are often blamed to change the structure of labour demand towards a decrease in the demand of low skilled and a rise in the demand of highly skilled employees. Further on, there are also reasons for short-run changes in the demand for different skills, e. g. labour hoarding during a business cycle. In this study a unique panel data set from personal interviews with leading representatives of more than 4000 western German establishments on a yearly basis from 1993 to 1998 is available to investigate the changes in the structure of labour demand. Using a dynamic labour demand approach, one can find short-run and long-run effects. The two-step GMM estimates show that there is some evidence for labour hoarding as well as for the hypothesis of skill-biased technological change. International trade has no significant influence on the structural demand for labour.

### Beyond “Manucentrism” – Some Fresh Facts About Job and Worker Flows

**Paul Bingley, Aarhus University, DK**

**Tor Eriksson, Aarhus University, DK**

**Axel Werwatz, Aarhus University, DK, Humboldt University, Berlin, Germany.**

**Niels Westergård-Nielsen, Aarhus University, DK**

In recent years, several studies have described job and worker flows for various countries based on matched employer-employee data. See, for instance, Davis and Haltiwanger (1992) and Anderson and Meyer (1994) for the U.S., Hamermesh, Hassink and van Ours (1996) for the Netherlands, Abowd, Corbel and Kramarz (1996) for France and Albæk and Sørensen (1998) for Denmark. These studies document how individual establishments adjust their workforce in response to the multitude of shocks they are exposed to, and go on to develop the implications of this micro-level adjustment process

for aggregate, macro-level quantities such as total job creation and total job destruction in an economy. The findings of this largely data-driven research have produced “stylized facts” about such features of job and worker flows as their magnitude, persistence, cyclicality, distribution between individual establishments. In several cases, these empirical findings have been at odds with assumptions and implications of existing theoretical models and have challenged theorists to develop new models that are more in line with these facts.

### Labour Productivity Growth in Dutch Business Services - The Role of Entry and Exit

**H.P. van der Wiel, CPB Netherlands Bureau for Economic Policy Analysis, The Hague**

Labour productivity growth in Dutch business services has been lacking in recent years. Using a unique firm-level data set of Dutch business services, this paper analyses the effect of enterprise demographics for labour productivity growth. Special attention is given to the contribution of entering and exiting firms to productivity growth. The study shows that entering firms are less productive than incumbents. Remarkably, entering firms are equally as productive as exiting firms. Since many new firms entered the market of business services in the period investigated, aggregate productivity growth did not improve. Moreover, incumbents’ productivity hardly changed over time.

## *Firm Dynamics*

### Post-Entry Selection among Newly Founded Firms in East and West Germany after Unification: A Competing Risk Model with Forced Bankruptcy Liquidations and Voluntary Liquidations

**Susanne Prantl, University of Mannheim**

This paper provides an investigation of the post-entry selection among newly founded firms either via voluntary liquidation or via forced bankruptcy liquidation for the period since the unification of East and West Germany in 1990. The exit decision of newly founded firms is discussed in the context of the self-selection mechanism among entrepreneurs and the coexistent external selection mechanism implemented by the insolvency law. The estimation of semi-parametric competing risk models is based on panel data samples for the period from 1990 to 1997, which are drawn from an East German and a West German credit rating database. The samples cover together about 20,000 firms founded between 1990 and 1994 in all East and West German regions and in all industries in the manufacturing, construction, trade and service sectors.

The type-specific baseline hazard functions indicate that selection via bankruptcy liquidation starts as the first wave of voluntary liquidations already tapers off. The selection among firms founded during the period of economic transition in East Germany is delayed compared to the selection among West German firm foundations of the same period. Several empirical results are consistent with the relevance of owner-specific liquidation thresholds and venture return-driven effects. For example, indicators of high academic education are significantly negatively correlated with the risk of forced bankruptcy liquidation and not significantly correlated with the risk of voluntary liquidation in both parts of Germany. Moreover, the significant correlation of firm size at market entry, firm affiliations, and a firm's payment history with the liquidation risks are in line with the expected impacts of the German insolvency law.

## How Long Does It Take for New Firms to Become Competitive?

**Karim Moussallam, INSEE**

Despite the pressures of competition and of investors, the profitability of firms varies widely at a given time, even within a sector. One of the reasons is that newly established firms frequently remain underperforming several years after birth. The aim of this paper is to investigate how long that can be, and whether this lapse of time is linked to some features of the main industry in which the firm operates. The use of data on a span of seven years and for a large number of firms makes it possible to apprehend accurately enough the evolution of the relative performance of new firms compared with their competitors (‘profit dynamics’). In this way, a process of catch-up can be outlined for most new enterprises. From birth up to at least the age of seven, the percentage of firms as profitable as half the firms of their sector increases constantly, whichever generation is considered. The second stylized fact that emerges is that at least half the enterprises of a given generation are performing at the age of five. The median rate of profit of a sector can thus be considered as a benchmark. A firm that doesn’t reach this level must either adapt or disappear, as a general rule. For underperforming firms according to this criterion in a given year, adaptation in the next year is more frequent than disappearance, at least when they are young. To each sector and generation of firms can be associated a catch-up duration, which separates the year of birth from the date at which half the new firms are relatively performing. This duration is in the order of five years, but varies according to the sector. A question is then whether this statistic measures a structural feature of the sector. Unfortunately, the order of the sectors according to this duration appears to be fairly sensitive to the generation taken into account, and thus to the economic situation. This is partly due to the sectors with a small number of enterprise entries. For these, the estimation of the duration is probably too inaccurate to be useful. After removal of low-entry sectors, and ignoring the remaining instability, the paper then tries to link the catch-up duration to features of the sector, notably those that can be interpreted in terms of barriers to entry. The catch-up duration is significantly correlated with two indicators of the intensity of competition: the entry rate and the level of profitability, as well as the sector growth. A simultaneous equations model shows an interaction between the catch-up duration and intensity of competition. The duration conveys a significant and original information on both indicators of competition intensity, acting as a barrier to entry, even when the heaviness of the production technology is taken into account. In the opposite direction, the intensity of competition tends to accelerate the catch up, as new firms scramble to become competitive, while the heaviness of technology slows it down. In particular, the positive effect of the capital intensity on the catch-up duration may reflect that of learning by doing.

## Firm Exit, Vintage Effect and the Business Cycle in Norway

**Kjell G. Salvanes, Norwegian School of Economics & Business Administration**

**Ragnar Tveterås, Stavanger College**

In spite of the large and growing literature on producer heterogeneity and firm exit behavior, little attention has been paid to the vintage capital theory of firm exits as an alternative hypothesis to learning/selection. Interpreted at the firm level the vintage capital theory predicts that exit rates increase in the age of capital. The present paper uses a panel of Norwegian manufacturing plants and constructs an index of capital age in addition to the age of the establishment in order to disentangle the effects of selection/learning and vintage capital on exit rates. The empirical results suggest a U-shaped exit function in the age of the plant implying both a learning effect and a vintage capital effect. The vintage capital effect is present under different assumption concerning reinvestments and controlling for unobserved heterogeneity. The exit rates are found to depend on the business cycle in that exits increase in a severe downturn. Our results also support the assertion that recessions are periods of cleansing where old capital equipment is scrapped via exiting plants.

**Keywords**: Firm exit, vintage effect, business cycle, manufacturing.

**JEL Classification:** D24, L11, O33

# *Corporate Governance*

## Disorganization or Self-Organization?

**FRANCESCA RECANATINI, The World Bank**

**RANDI RYTERMAN, The World Bank**

Transition provides a rare opportunity for insight into the endogenous development of market institutions. Production activities during the Soviet regime were highly coordinated and organized by the central authority. These coordinating mechanisms were disrupted during the transition period leading to an increase in the transaction costs for firms. Blanchard and Kremer (1997), among others, emphasize the negative impact of this "disorganization" on output behavior at the beginning of transition. Though this argument is correct, we believe that this and similar works stop short of a fuller characterization of transition by concentrating on the disruptive effects of the reform process. This paper begins where the former works end by examining one of the key institutions that have emerged spontaneously in response to the challenges of transition: business associations. Its main contribution is to provide empirical evidence that "institutions", which help coordinate production and trade, spontaneously emerge in an environment characterized by widespread "disorganization". sing a largely unexplored, firm-level data set, we document the emergence of business associations at the beginning of transition and provide evidence that these new coordinating institutions mitigated the initial output decline. Building on the recent advance of the science of complexity, we interpret the emergence of these informal institutions as the firms' spontaneous attempt to coordinate activities in a decentralized economy.

**Keywords**: Coordination Problems, Transition, Networks

**JEL Classification**: E23, P21, D83, L10

## The Government as a Shareholder: Evidence from China

**George Lihui Tian, London Business School**

The corporation with the government as one shareholder may have different technical features from the public enterprises, but the comparative value of mixed enterprises still remains a puzzle, particularly for a transitional economy. Studying the public listed companies in China, we examine whether the value of a firm is a function of government shareholding. The appropriateness of three hypotheses as ownership irrelevance, the helpful shareholder and the political shareholder is tested in Chinese economic settings. This paper reveals a significant negative curvilinear relationship between government shareholding and corporate performance. As the first empirical finding on the mixed enterprises with a large sample, this evidence from China suggests the inefficiency of mixed enterprises, which may have a certain implication on the Chinese market socialism experiment.

## Technical Efficiency in Italian Manufacturing: The Role of Corporate Governance

**Sergio Destefanis, University of Salerno, Italy**

**Vania Sena, University of York, UK**

In this paper we use parametric and non-parametric techniques to provide technical efficiency measures for a sample of Italian manufacturing firms taken from the 6$^{th}$ Survey

from *Mediocredito Centrale*. Then, we take advantage of the wealth of qualitative information characterising this data-set data in order to focus on the explanation of the distribution of the efficiency scores. From a survey of recent contributions in the corporate governance literature, it is found that the higher the concentration of shares in a few hands, the greater may be the control that shareholders exert upon managers. Our results show indeed that the performance of firms in terms of efficiency is positively correlated with the quota of firm's shares detained by the largest shareholder. Special emphasis must be given to this result, which to our knowledge is obtained for the first time in the literature on technical efficiency, because allowance was made in the analysis for various other potential correlates of efficiency (geographic location, the education of the workforce and the degree of competition faced by the firm).

## *Firm Performance*

### Determinants of Mark-ups in Dutch Construction Firms

**Marcel H.C. Lever, Foundation for Economic Research in Construction ("SEOB"),**

**Erasmus University, Rotterdam, the Netherlands**

**Joris Meijaard, Foundation for Economic Research in Construction ("SEOB"),**

**Erasmus University, Rotterdam, the Netherlands**

The purpose of this paper is to investigate the determinants of markups of Dutch construction firms. The mark-ups are determined by a method due to Roeger (1995). In measuring the mark-ups material costs are included. A two-stage least squares procedure is used to obtain consistent standard errors. The data are annual production statistics for about 4,000 Dutch construction companies in the period 1982-1992. Our results suggest that mark-ups of small firms exceed those of large ones. Mark-ups in civil engineering appear to be higher than in building. No evidence is found of any impact of market structure on mark-ups.

**Keywords:** price setting, mark-ups, firm size, construction sector, the Netherlands

**JEL Classification:** D43, L13, L74

## Plants and Productivity in International Trade: A Ricardian Reconciliation

**Andrew B. Bernard, Tuck School of Business, Dartmouth College**

**Jonathan Eaton, Boston University**

**J. Bradford Jensen, Center for Economic Studies, Bureau of the Census**

**Samuel S. Kortum, Boston University**

We attempt to reconcile observations about plant level exporting behavior with international trade theory and the aggregate volume of trade. Our framework extends the basic Ricardian model to accommodate trade among many countries separated by trade frictions in an environment of imperfect competition. The model is calibrated to ¯t actual patterns of bilateral among nearly 50 countries. We then simulate the model to see how well it can explain several basic facts about U.S. plants: (i) the wide dispersion of measured productivity across plants, (ii) the higher measured productivity of exporters, (iii) the small fraction of active producers who actually export, (iv) the small fraction of revenue earned from exports even by those plants that do export, and (v) the much larger size of plants that export. We pick up all the basic qualitative features, and go quite far in matching relevant magnitudes. We perform counterfactuals to study the impact on U.S. producers of both a rise in U.S. production costs and a lowering of trade frictions throughout the world.

**Keywords**: Ricardian trade, exporting, productivity, Census of Manufactures

**JEL Classification**: F11, F17, O33

# *Firm and Financial Capital*

## The Bond Market: The Effect of Reputation on Internal Funds of the Firm

**Michiel van Leuvensteijn, Maastricht University**

This paper examines the relationship between reputation and the degree in which a firm finances its investment with its own capital. The relationship depends on the degree in which a firm has access to the bond market in the Netherlands. To examine this relationship we use a model in which reputation affects the monitoring costs of the bank. Further, the degree in which a firm draws private benefits from a investment is negatively related to reputation of the firm. On the bases of Holmstroem and Tirole (1997) a model with a relation between reputation, own capital and bonds issued by the firm is formulated. The model predicts that firms with only access to the bond market reduce their internal funds less with an increase in reputation than firms with access to the bond market and the credit market. The internal funds of firms are less responsive to reputation when a firm acquires its external funds only from the credit market in comparison with firms which have also access to the bond market. This model is estimated by using micro-economic data for large corporate firms over the period 1977-1997. Reputation of firms is constructed out of financial indicators used by Standard and Poor's. The main conclusion that can be drawn is that reputation has a stronger negative effect on the internal funds when a firm has access to the bond market as well as to the credit market compared to firms which finance their external funds totally through the credit market or totally through the bond market, although the differences are not significant.

## Corporate Liquidity Demand in the Netherlands

**Allard Bruinshoofda, Department of Economics, Maastricht University, Maastricht, the Netherlands**

The aim of this research is to get insight in the corporate demand for liquidity in the Dutch economy. Theoretical predictions and empirical hypotheses stem from a capital market that is subject to imperfections in the form of the presence of asymmetric information. Along these lines one may think of the nature of liquidity shocks (frequency, magnitude), other firm specific characteristics (financial capacity, size of investment outlays) and the macroeconomic performance (monetary policy, business cycle) as relevant determinants of corporate cash demand. In particular, it can be argued that firms are not able to attract liquidity from the market whenever they need to. This leads us to hypothesize that firms hold cash in order to be able to invest in profitable projects; to prevent them from getting into liquidity problems due to unforeseen leaps in costs or squeezes in earnings, and; to insulate themselves somewhat from business cycle fortunes and adversities. Having examined corporate cash holdings for the large Dutch corporations for the period 1981-1997 we are quite confident of the validity of these hypotheses. Indeed, profitability - as an indicator of investment opportunities - has an important impact on the liquidity ratio, even when we correct for the ability of the firm to generate funds. Additionally, the volatility of cash flow over the recent business history induces firms to hold on to an additional amount of precautionary cash. Finally, macro-economic credit conditions are important determinants of corporate cash holdings; in a well-performing economy firms need cash to expand their scales of operation; monetary ease facilitates an increase in cash balances, while inflation makes cash holdings more expensive and also requires cash to be invested in inventories and goods in production.

**Keywords**: Asymmetric information, Liquidity demand

## *Firm Dynamics*

### Firm Survival and Contestability in the Ivorian Manufacturing Sector: Non-parametric and Parametric Hazard Estimations on Enterprise Micro Data.

**Karine Chapelle, University of Auvergne**

This paper examines the process of firm selection in Côte d'Ivoire manufacturing sector. Non parametric and parametric durations models are used for estimations on 230 firms surveyed during March 1995 and March 1996 for the World Bank Regional Program on Enterprise Development (RPED). The main findings are that firms are selected on the basis of active learning and that hazard rate follows positive duration dependence suggesting that mature firms are replaced by younger enterprises. Sunk costs as well as scale economies act as barriers to survival. But the firms' personal perceptions of contestability as well as, the sector-based average perceptions of competition are important determinants of firm survival. Intensive technologies in terms of physical and human capital, large firms increase enterprise longevity. Despite the presence of liquidity constraints, firm growth does not constitute a good strategy for survival. Finally, political and economical environment plays an important role essentially by the bias of growth perspectives and demand instability. Structural Adjustment programs and the 1994 devaluation had a negative impact on firm survival.

**Keywords**: Active leaning, passive learning, duration models, LDC, sunk costs

**JEL Classification**: D21, D4, L1

### Mobility, Reversion, Divergence: Evolution of Returns in British Industry

**Paul A. Kattuman, University of Cambridge**

The cross sectional dispersion of enterprise profit margins has increased secu-larly, and countercyclically in the UK. Geroski and Gregg [5], reporting these findings, have highlighted the need for detailed analysis of the phenomenon. This paper examines the forces driving cross sectional dispersion, allowing that competitive environment may have changed over time. We relate time evolution of cross sectional dispersion to \intra-distributional mobility", and attempt to determine the portion of this mobility that takes the form of the competition driven, mean reversion component. Evidence suggest that shocks from the business environment may have increased significantly, out-weighing mean reversion, and boosting the dispersion of profitability. This has implications of corporate strategy and competition policy.

**Keywords**: Competition, Shocks, Business performance, _ convergence,_ convergence, Intra- distributional mobility.

**JEL Classification**: L19, L60, C21, C22

## Are Business Surveys Useful to Predict Firm Mortality?

**Cheti Nicoletti, Istituto Nazionale di Statistica, Roma**

Last time, Istat statistical register on enterprises was updated, is 1996. To this purpose both surveys and administrative registers data were used. Presently this register covers the entire population of enterprises, including very small ones, and contains a complete information of the joint distribution of enterprises classified by region, size, age and sector as in a standard industry census. The aim of the work is to estimate the mortality probability for small firms combining data from the statistical register and from the annual sample survey on small enterprises (SME). Following Imbens and Lancaster (1994) and adapting the methodology they applied to estimate employment probabilities, we use the generalised method of moments (GMM) to estimate a qualitative model for the probability of death in 1996 conditional on a set of lagged explanatory variables, which are known from the SME survey. An additional aim is to verify if the population and the sampling probabilities of death are identical, conditional on the variables used to identify the stratums of the SME sample. In other words we test if the probability for a firm to be sampled and respondent depends on the value of the dependent variable so that the sampling scheme is endogenous. The paper is in five parts. Part one describes the model used for death probability and underlines the need to address and solve the problem of missing covariates. The second part provides a brief survey of different approaches to the treatment of the missing covariates problem. In part three we propose a new method of estimation of a quantal response model in presence of missing explanatory variables. This is a generalised method of moments that takes account of the selection problem caused by the missing covariates and exploits the information available for units with incomplete observations. Part four presents the empirical results; in part 4.1 we test if the probability to belong to the SME survey depends on the death probability, while in part 4.2 we estimate the model for death probability. Finally in part 5 we deduce some conclusions and suggestions for further developments of the analysis.

# *Firm and Labour*

## Wages, Productivity and the Dynamic Interaction of Businesses and Workers

**J. C. Haltiwanger**

**J. I. Lane**

**J. R. Spletzer**

### Firm Productivity Dispersion in an Equilibrium Search Model Using Employer Data – Some Notes

**Gerard J. Van Den Berger, Vrije Universiteit, Tinbergen Institute & CEPR**

**Aico Van Vuuren, Vrije Universiteit, Tinbergen Institute**

We investigate the performance of equilibrium search theory by using employer data. We test these predictions without the need to structurally estimate the whole model. Our model predicts among other tings that the mandatory minimum wage, the benefit level, the average productivity level and the dispersion of productivity levels. We use enterprise micro data which contain both wage and productivity levels as well as elapsed job durations. Out empirical implementation is decomposed within two stages. In the first stage, we estimate the friction parameters of the model. In the second stage, we use a reduced form model to test the relations as predicted by the equilibrium search model.

### Employment Adjustment Costs and Establishment Characteristics

**Lucia Foster, Bureau of the Census, Center for Economic Studies**

Microeconomic employment adjustment costs affect not only employment adjustments at the micro level but may also profoundly impact aggregate employment dynamics. This paper sheds light on the nature of these microeconomic employment adjustment costs and quantifies their impact on aggregate employment dynamics. The empirical exercises in the paper analyze the differences in employment adjustments by establishment characteristics within a hazard model framework using micro data for approximately 10,000 U.S. manufacturing plants. I find that employment adjustments vary systematically by establishment characteristics; moreover, these variations suggest that employment adjustment costs reflect the technology of the plant, the skill of its workforce, and the plant's access to capital markets. Concerning the structure of the adjustment costs, the employment adjustments have significant nonlinearities and asymmetries consistent with nonconvex, asymmetric adjustment costs. Specifically, employment adjustment behavior shows substantial inertia in the face of large employment surpluses, varied adjustment behavior for small deviations from desired employment, and (S,s)-type of bimodal adjustments in response to large employment shortages. Finally, the micro level heterogeneity, asymmetries, and nonlinearities significantly impact sectoral and aggregate employment dynamics.

**Keywords**: Labor Demand, Adjustment Costs, Panel Data.

**JEL Classification**: C33, J23, J32

## *R&D, Innovation*

## The Impact of R&D on Productivity: Evidence from Danish Manufacturing Firms.

**Mogens Dilling-Hansen, University of Aarhus, University of Copenhagen**

**Tor Eriksson, Aarhus School of Business, University of Aarhus**

**Erik Strøjer Madsen, Aarhus School of Business, University of Copenhagen**

**Valdemar Smith, The Danish Institute for Studies, University of Copenhagen**

The aim of the paper is to examine the relationship between R&D capital and productivity using micro data for Danish manufacturing firms. We account for the influence of factors such as ownership, innovative characteristics and source of funding. The return to R&D capital is estimated to be in the neighbourhood 15 per cent. In the short run R&D labour has a negative effect. Furthermore, we find that the foreign-owned firms' R&D capital is associated with greater returns than domestic firms, whereas the source of funding, innovative characteristics and ownership dispersion seem to have only minor importance for firm productivity.

**Keywords**: Productivity, R&D, innovation.

**JEL Classification**: L11, D24

## Horizontal and Vertical R&D Cooperation

**Joachim Inkmann, University of Konstanz,**

This paper introduces a second, vertically related industry into the usual one industry oligopoly framework of cooperative R&D investment between firms operating on the same product market. R&D efforts are affected by intra- and inter-industry R&D spillovers. Horizontal and vertical R&D cooperation scenarios are compared to R&D competition. It turns out that vertical R&D cooperation is usually the only stable equilibrium in the sense that no firm has an incentive to chose any other R&D scenario. Empirical implications concerning the relationship between R&D intensities and R&D spillovers are derived and empirical evidence is given using data of German manufacturing firms.

**Keywords**: R&D cooperation; R&D spillovers; vertical relations

**JEL Classification**: O31, L13, C21

### Computerization, Use of Information Technology and Organizational Changes: The Example of French Accounting Activities

**Rouquette Céline, Insee**

**Cases Chantal, Insee**

Computers are more and more used by French enterprises: in 1998, one employee out of two used a computer at work. Not only big enterprises, but also small and midsize enterprises, use computers. The nature of equipment tends to evolve, fixed desktops being replaced by network computers, and laptops being more and more used. The Internet becomes widespread. This phenomenon often implies a change of the way people work, and thus a new organization within the enterprise. In order to analyse the way French firms engage in the Information Economy, and the impact it has on labour organization, the French statistical agencies have made a survey about computerization and organizational changes having taken place between 1994 and 1997. Made in 1997, the survey covered several sectors : manufacturing, food industry, retail trade, and one service sector, the accounting activities. Insee chose to select accounting firms for several reasons: indeed, this service sector stands among the most modern business services. In 1997, almost 100% of the accounting firms having at least one employee used a computer. Besides, a fierce competition between worldwide leaders has increased a need for innovation - innovation in products and innovation in the way services are provided, thus in the work organization. This paper focuses on the case of this service industry.
In a first part, we will describe the methodology used for the survey. In a second part, we will then provide a panorama of the first results obtained in terms of computerization and organizational changes: penetration of computers, type of hardware, software, use of Internet, strategy, outsourcing, quality management. We will study more particularly how accounting services differ from manufacturing industries. In a third part, we will analyse the link between information technology use, the organization of labour, and performances of the firm. A factor analysis will allow us to explain how computerization and organizational changes are linked, and to draw clusters of enterprises, each cluster being defined by a specific behaviour in terms of computer use and work organization within the firm.

## *Investment and Capital*

### Investment Behaviour in the Netherlands: An Empirical Study of Adjustment Costs

**Wilko Letterie, Maastricht University**

**Gerard A. Pfann, Statistics Netherlands**

We analyse investment data of Dutch manufacturing firms collected by Statistics Netherlands by estimating a switching regression model. The purpose of this paper is to investigate the relevance of recent theoretical studies of investment behaviour stressing the role of non-convexities in the adjustment cost technology. Our results indicate that such non-convexities are particularly relevant for expansionary investments.

**JEL Classification**: E22

## Capital-Energy Substitution Revisited: New Evidence from Micro Data

**Sang V. Nguyen, Center for Economic Studies, U. S. Bureau of the Census**

**Mary L. Streitwieser, Center for Economic Studies, U. S. Bureau of the Census**

We use micro data for 10,318 plants to estimate elasticities of substitution between energy and capital. We find that energy and capital are substitutes. We also find that estimates of Allen elasticities of substitution -- a standard measure of substitution – are sensitive to varying data sets and levels of aggregation. In contrast, estimates of Morishima elasticities of substitution — which are theoretically superior to the Allen elasticities -- are more robust. We conclude that micro data provide more accurate elasticity estimates than those obtained from aggregate data and the Morishima elasticities are the preferred measure of factor substitution.

**JEL Classification**: L60, Q40

## The Impact of Computers on Productivity in the Trade Sector: Explorations with Dutch Microdata

**Lourens Broersma, University of Groningen**

**Robert H. McGuckin, The Conference Board**

Trends in productivity, labor, and investment in the retail and wholesale trade sectors for the Netherlands in the 1988-94 period are examined. The analysis is based on a longitudinally linked panel of firms from the annual survey of Production Statistics collected by Statistics Netherlands (CBS). We find that computer investments have a positive impact on productivity and that the productivity impact of computers is greater in retail than in wholesale trade. There are a number of possible reasons for this finding, including greater penetration of computers in wholesale trade and differences in the way computers are deployed in the two sectors. Contrary to studies in the U.S., however, the impact of computer capital is about the same as other forms of capital. Differences in empirical specifications arising from the absence of data on capital suggest some caution with respect to this conclusion. We also find increased use of “flexible” employment practices, particularly among retail firms, and these appear related to computer use. As expected the measured impacts of computers on productivity are quite sensitive to the particular deflator used for computer equipment.

## *Productivity*

### Use of Micro Data to Analyse Labour Productivity in the Italian Retail Trade Sector

**Anna Rita Giorgi, ISTAT - DCII - SCO/D**

**Roberto Gismondi, ISTAT - DCII - SCO/D**

In this paper we present some econometric applications based on a database got from the yearly business statistics currently carried out in Italy and related to the enterprises operating in the retail trade sector (NACE 52) in 1995. What we want to study is: 1) the overall link among the ratio between output and labour input - used as a productivity indicator - and some independent variables measured at the micro level; 2) the variability of results in function of aspects as sectoral breakdown, geographic location, number of persons employed and class of investments; 3) the identification of the statistical model able to describe with the highest precision the productivity structure concerning retail trade enterprises. Main results showed that: a) factors as class of investments and geographic location are not so relevant in order to detect true different productivity levels; b) the employment class has an influence on productivity stronger than the sector of activity, measured at the 3-digits level of NACE; c) with the recourse to a not linear discriminant algorithm we could identify a statistical model more precise than the one got with ordinary regression models.

**Keywords**: Dummy variable, Persons employed, Productivity, Regression model, Retail trade, Turnover

### Linking Quantitative and Qualitative Data: An Analysis of the Role of Organizational Behaviors and the Relative Productivity of University Technology Transfer Offices

**Donald Siegel, Business School, University of Nottingham**

**David Waldman, School of Management, Arizona State University West**

**Albert Link, Department of Economics, Univ. of North Carolina at Greensboro**

We present quantitative and qualitative evidence (field research) on university technology transfer offices (TTOs). These offices negotiate licensing agreements with firms to commercialize university-based technologies. A stochastic frontier production function framework is used to assess the relative productivity of 113 university TTOs. Our field research provided a useful reality check on the specification of the econometric model. The empirical findings imply that licensing activity is characterized by constant returns to scale. Environmental and institutional factors appear to explain some of the variation in TTO efficiency. Relative productivity may also depend on organizational practices in university management of intellectual property, which potentially attenuate palpable differences in the motives, incentives, and organizational cultures of the parties to licensing agreements. Unfortunately, there are no existing data on such practices, so we rely on inductive, qualitative methods to identify them. We present detailed information on our use of these methods. This information may be useful to economists who are contemplating fieldwork. Based on 55 interviews of managers/entrepreneurs, scientists, and administrators at five research universities, we conclude that the most critical organizational factors are likely to be reward systems for faculty, TTO staffing and compensation practices, and actions taken by administrators to extirpate informational and cultural barriers between universities and firms.

### Training, Productivity and Firm Size

**Jan M.P. de Kok, EIM Small Business Research and Consultancy, Zoetermeer, the Netherlands; Tinbergen Institute, Erasmus University Rotterdam, the Netherlands.**

The role of human capital as a specific production factor and a source for sustained competitive advantage has recently received much attention. An important means for enhancing human capital is firm-provided training. This paper describes a study into the relevance of firm size on the impact of firm-provided training on firm production. A nested production function is introduced: human capital is one of the production factors of a firm, and firm-provided training serves as a production factor for human capital. This production function is estimated using panel data on 173 Dutch firms. The results suggest that the training support per employee (defined as the average time a firm spends on setting up and coordinating a training programme) has a positive influence on the returns of a training course. Since on average small firms provide less training support per employee, this implies that small firms benefit less from firm-provided training than their larger counterparts.

**Keywords**: firm-provided training, SME

**JEL Classification**: J20, J24

## *Firm and Labour*

## Experience and Productivity in Wage Formation in Finnish Industries

**Hannu Piekkola, Research Institute of The Finnish Economy**

**Satu Hohti, Statistics Finland**

**Pekka Ilmakunnas, Helsinki School of Economics – Department of Economics**

The aim of this paper is to discriminate between alternative compensation policies in Finnish industries using linked employer-employee data covering the period 1987-1992. Experience-related payments are shown to vary in industries and in education levels. Experience payments from initial tenure, and also from general experience, are increasing with education level. Earnings equations should also have a firm-level compensation term with a firm-specific intercept and seniority effect. There is a clear association of firm-level compensation to education, in contrast to weak correlation to other human capital components such as general experience. We also examine the efficiency of the compensation policies on the basis of their impact on labor and total factor productivity. We find seniority compensations efficient only from longer tenure. High productive industries are instead characterized by high general experience payments at the beginning of working career.

**Keywords**: wages, compensation policy, productivity, industry differentials

**JEL Classification**: J21, J31, J50, C22

## Firms’ Wage Adjustments: A Break from the Past?

**Erica L. Groshen, Federal Reserve Bank of New York**

**Mark E. Schweitzer, Federal Reserve Bank of Cleveland**

Despite advances in understanding the policies that cause inflation, economists know little about inflation’s manifestations and transmission in the marketplace. For example, how does inflation affect wages in an economy composed of heterogeneous agents making individual optimizing decisions? We know that there is a wide dispersion of wage changes in any year (Groshen and Schweitzer 1998). In this paper we ask whether inflation and its changes alter the distribution of wage shocks— rather than being neutral for the distribution as conventional theories of wage adjustment would suggest. Distributional effects on wage changes have been the subject of conjecture by academic, policy, and business economists, but rarely the subject of systematic inquiry. Altered distributions in the presence of inflation would indicate that simple wage models— i.e., ones based on representative or aggregate agents— are inadequate to describe the complexity of wage determination. Initially, characterizing the nature of this complexity allows us to identify the variety of labor-market responses to shocks. From there, we can develop and evaluate richer models of the wage-setting process.

# Monopsonistic Discrimination and the Gender Wage Gap

**Erling Barth, Institute for Social Research, Oslo, and University of Tromsø**

**Harald Dale-Olsen, Institute for Social Research, Oslo**

Models of worker flows have revitalised the idea of monopsony in the labour market. We apply such a model to gender differences. We argue that monopsonistic discrimination may be a substantial factor behind the overall gender wage gap, in particular with respect to differences arising between occupations and establishments. Using matched employeremployee data from Norway, we investigate the wage structure within and between establishments, and present novel evidence that the establishments' excess turnover of employees is sensitive to the wage premium of men, but not to the wage premium of women. Furthermore, we show that male turnover is more wage-elastic than female turnover.